METHOD FOR AUTOMATICALLY ELIMINATING AN ERROR OCCURRING DURING THE OPERATION OF AN ELECTROGRAPHIC PRINTING OR COPYING DEVICE, ELETROGRAPHIC PRINTING OR COPYING DEVICE AND COMPUTER PROGRAM FOR SAID DEVICE

Printing or copying devices (called printing devices in the following) comprise a plurality of components as a rule, in which every component is composed of modules. The printing component and input component or, respectively, the output unit for print material are examples. This type of printing device, for instance, can be learned from WO 98/18052 A1. Therein the printing component contains two printing modules, for example a photoconductor drum, transfer module, fixing module, module for determining the transit path for print material through the print component, etc. Additionally, further components are provided as input modules and output modules, such as with a stapler.

In such a printing device, errors can occur during operation that need to be eliminated. For instance in the transit path congestion can occur, for example in the transfer module or arranged in the switch modules or in the fixing module. To eliminate these types of errors, it is known from WO 98/18055 A1 that a valve arrangement can provide access to the transit path. A realization of this valve arrangement is specified here, as well as other adjustments that allow access to the transit path in the aforementioned prior art. To eliminate congestion of print materials in these valve arrangements, service personnel operating the valve arrangement are needed.

US 5 479 240 A specifies how an error such as a paper jam can be eliminated in a copying device without an operator having to intervene. The following steps need to be carried out:

-initially an examination will determine whether the error can be eliminated automatically. If this is not the case, a manual elimination will be called for.

-if the error can be eliminated automatically, sensors will determine in which component the error appeared. If the component has been identified, it will be initiated by a CPU, for instance, to transport a damaged sheet of paper further. If that transit is not successful within a predetermined period of time, a manual error correction is switched to.

-if the transit through the component has been successfully implemented, further transit through succeeding components will be attempted in a corresponding manner until the sheet of paper reaches the output component.

EP 0 810 484 A1 specifies a transport system for print material in which individual components of the transport system can automatically execute a task after they have received control information from a central control unit. The components are designed such that they can implement a self-diagnosis and a self-repair in which these actions ensue in parallel manner to that of the central controller. If the central control unit has established an error, it gives control information in which the type of error that has occurred is specified to the components. This information enables the components to eliminate the error automatically.

EP 0 416 919 A2 discloses the synchronization between image sampling and paper transport in a copier device. If it is established that the transport of paper is too slow, the copying process will be stopped.

EP 0 583 928 A2 specifies a device in which the paper feed can be monitored in the transit path. For that the rotation speed of the transport rollers for the paper is measured. If the measured rotation speed does correspond to a predetermined value, an error message is generated.

The problem forming the basis of the invention to specify a further method with which errors occurring in the print device, such as, for example, a jam of the print material in the transport path, can be corrected without activation of service personnel.

This problem is solved according to the features of claim 1.

With the method the control units provided for the operation of the units under supervision of a main control unit are used to check the modules of the unit for errors and, if a correctable error is determined, to correct this error. It can thereby advantageously be checked per unit of each module in succession, whereby given the correction of a print material error it is appropriate to begin with that last module (viewed in the transport direction of the printing material) and to successively test the adjacent and preceding modules. At the end of the test even the error(s) is/are corrected or a status signal "error(s) is/are not corrected" is emitted. Another advantage is that, given an erroneously working module, it is checked whether the operation is also possible without this module and when this is possible, to report this.

Developments of the invention result from the dependent claims.

The error correction can be carried out separately per component in this manner. It is, however also, possible to test all components one after another in the opposing direction of the transport path of the print material module-by-module and to correct possible identified errors, if possible.

The invention is further exemplified using an exemplary embodiment.

Depicted:

Fig. 1 a principle illustration of a printing device for single sheets of the printing material corresponding to WO 98/18052 A1.

Fig. 2 a flow diagram of the method.

A printing device for single sheets of print material as clarified explicitly in WO 98/18060 A1 results from Fig. 1. Only the components usable for the specification of the inventions are given, for the rest refer to WO 98/18060 A1, which is included herewith in this disclosure. The printing device DR is comprised, according to Fig. 1, of three components: the printing component 10, the input component 16, and the output component 30 for the printing material. The print component 10 is assembled from modules. For example along the transit path 50, 52 lie print material switch modules W, two printing groups D1 and D2 and fixer modules 12 and 14, respectively of known design. The printing groups D1 and D2 can be realized as electrographic printing groups that comprise a photoconductor drum on which charge images of the images to be printed are generated in known manner that are transfer printed onto the printing material after development via toner in transfer modules 44 and 46. Aided by the switch module W, the single sheets of print material can be fed to printing groups D1 and D2 either separately or sequentially for printing on the front or the backside. The in- [sic] output components 16 and 30 for print materials are assembled from modules as well. Resulting from Fig. 1 are switch modules W through which the sheets of print material can be conducted [sic] output containers 32 through 36 or output channels at the following units such as staplers or, respectively, supply containers 18 through 24 for the pages of print material, and an input channel 26 to which print material can be supplied from other input units are shown in the input unit 16.

The individual components of the printing device DR are respectively controlled by control units ST, the print component 10 is controlled by print control component D-ST, the input component 16 is controlled by input control component E-ST and the output component 30 by the output control component A-ST. These control components ST are linked with a main control component H-ST that coordinates the operation of the print device. The control components ST are of known design and are therefore not further specified. Examples of which result from WO 98/39691 A1.

If an error occurs in the transport of print material in the print device DR, such as a jam of print material, it must be determined in which component and in which module of the appertaining unit the error has occurred. Furthermore, it must be determined whether the error is correctable without the intervention of service personnel. Control components ST (that prior emitted "error reports" upon occurrence of such errors to, for example, a main control component H-ST, from which it can be recognized where the error occurred) are activated. The goal of this invention is now to use the error reports to automatically eliminate errors when possible. The prerequisite is that an error that can be corrected without the intervention of service personnel exists in a module.

If, for example, an error exists in a particular switch module W, it can be attempted to clear the transit path for the print material by a change to the switch position. If this is not possible, it can be attempted to choose another transport path via the adjustment of another switch module W. The same can be proceeded with when an error occurs in a printer group or fixing module. Here it can be also be tried to correct this or to search for another transit path.

From the flow chart of Fig. 2 it results how it must be followed in order to for example, automatically correct an error in the transport path of the printing material. The flow is depicted from point of view of the main control component H-ST. It is assumed, for example in the explanation, that the error exists in the print unit 10.

After it has been determined in step S1, for example, by the print control component D-ST, that an error has occurred in the transit path of the print material through the printing unit 10, in step S2 a main error correction mode is switched to and it is tested whether the error can be automatically corrected. For this the error is reported to the main control component H-ST, which decides whether the error correction will be attempted thus, for example, whether the error is correctable in fixing module 12 and, if this is not possible, whether another transit path to a fixing

module can be set. If this is not the case, then the method for this particular print group is ended and an error report F1 is dropped off [sic] and supplied to the main control component H-ST that, in a step S 16, ends the main error correcting mode and sends a status signal F "error not corrected".

If the error is automatically correctable (step S2), the corresponding control component D-ST is changed to the error-correcting mode (step S3). In the next step S4 a command is emitted by the control component D-ST to the module that lies at the output relative to the transit path of the print material, said command prompting this module, for example the switch module W 4, to empty the transport path for the printing material. In the next step S5, the module attempts to clear the transit path. Whether this was possible is examined in Step S6. If the error can be corrected, the assigned control component D-ST sends the status signal SS1 "error corrected" in step S7. In step S8 it is queried whether all modules of the component are processed. If this is not the case, step 9 follows and the next module (viewed in opposite direction to the path of the print material), for instance fixing module 14, receives a command to examine and if necessary to clear the transit path, with the result that step S5 is reverted to. In step S9 the status of the previously examined module can be additionally communicated to the next module. When, in step S6, it is established that the error cannot be corrected (status signal SSF), though the preceding module can use the transit path (step S10), then in step S11 a status signal (SS2) is emitted that states that the error cannot be corrected, however the transit path is clear. If this is not possible, a status signal SS3 emitted in step S12 denotes that the error correction has failed and the transit path through this module is blocked.

If the query in step S8 results in that all modules of the print component 10 are processed, then in step S13 the status of all tested modules can be evaluated and, in step S14, it can be tested whether all modules were successful in the correction of the error. If this is the case, in step S15 status signal SS4 "error correction mode ended" is sent and the print device DR possibly restarted. When the query in step

S14 is negative, then the error signal F2 is sent with the consequence that, for example, the main control component H-ST stops the print device (Status signal F "error not corrected")

This method has been explained via the example of print component 10. Input component 16 or, respectively, output component 30 can be treated comparably.

Furthermore it is possible to initiate the test within a component.

In conclusion, the method can be applied such that the entire printing device is tested, initially the modules of output component 30 for print material, then the modules of printing unit 10 and finally the modules of input component 16.

The inventive method can be effected via a device control of an electrographic printing or copying device that comprises electronic components such as hardware and firmware and (as the case may be) a processor on which the corresponding computer program runs. Computer program products such as storage media (diskettes, CD-ROMs, magnetic tapes, optical storage platters, etc.) are therefore equally embodiments of the invention like files that are maintained on such storage media and exchanged or distributed over computer networks (LAN, WAN, Internet).

Summarized, the following can be established:

Errors that occur in the transit path of print material within an electrographic printing or copying device are automatically corrected as much as possible with the specified method. For this the single modules of components of the printing device are tested counter to the direction of the transit path of print material one after another, with the result that a module can or can not eliminate the error, whereby in the case a second test is run as to whether this module can be bypassed. A status report is generated at the end of the test process for every examined module and,

dependent on the results, the printing process is initiated again or the printing device is stopped.

Reference list:

DR	Printing or Copying device
D1, D2	Printing groups
W	Switch module
H-ST	Main control unit
D-ST	Print control component
E-ST	Input control unit
A-ST	Output control unit
SS	Status signal
SSF	Status signal "error not corrected"
F	Error signal = status signal "error not corrected"
S1 through S16	Processing steps
10	Print component
16	Input unit for print material
30	Output unit for print material
12, 14	Fixing module
44, 46	Transfer module
50, 52	transit path for print material